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ISDA 2010 Agriculture and Food
Innovation and Sustainable Development in Agriculture and Food
Montpellier – France
28 June – 1er July 2010
www.isda2010.net

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Abstract

The currently population of more than 70 million people in Ethiopia is expected to double within the next 30 years. Almost 80% of the populations are living in the countryside while the rest situated in urban area. An estimated five million people are suffering from lack of vitamins and essential minerals, of which 80% are children for the next generation. Every year, on the average, about five million people have problems securing enough food for them and need assistance. Preliminary surveys on nutritional and food consumption habit and secondary data have been taken with the objective to view the status of indigenous food consumption habits and a range of options for interventions. The major food security challenges are population growth, micronutrient deficiencies, pandemic diseases/AIDS, environmental degradation and droughts/floods/climatic change. Due to this fact Ethiopian agriculture is under full blow of climate risk. At a time when food production cannot keep pace with population growth, holistic solutions to the development related problems of hunger, malnutrition and poverty are needed more than ever. Indigenous/wild food items have a vast potential for addressing the food, health and income needs of the poor and landless. People around the world including neighboring countries to Ethiopia have a lot of interesting indigenous vegetable (IV) crops food habits, which can be lessens for Ethiopians. Majority of those IVs consumed in the world originated from Africa including Ethiopia. Those food items are inexpensive and accessible source of essential nutrients to a country like Ethiopia where the people experience malnutrition due to heavy dependence on cereals such as Tef (*Erogrostis tef*), which has low dietary source and productivity. Important foods of the world are not consumed in Ethiopia due to the reason that they are not exhaustively investigated so far. There has been no visible effort made to introduce/domesticate new food materials in our country. Many survey reports indicated that full of over looked and under developed food items that are not being fully exploited in the fight against hunger have been found in many parts of Ethiopia. Potentially use of those wild foods by the community has been also observed among which *Corchorus olitorius* in Afar Region, *Moringa olifera* in Southern nation and nationality people region and *Coccinia abyssinica* in Oromia region (South Western party of the country) contributing a significant role in human nutrition, income and medicinal value. But it has not been planned to study the potential and possible opportunities of those food source. It usually referred to as "wild foods" or "famine foods". It was indicated that in Ethiopia, there was no time when rural population has not been affected by drought, then famine. Seasonal food shortage is a common phenomenon in every part of the country, usually from July to September. On the contrary, use of wild food increased from 10% in normal year to up to 40% in famine period. Ethiopia is one of the country facing highest rates of child malnutrition in sub-Saharan Africa and highly selective and restricted food consumption habit practicing in Ethiopia aggravates the problem more and more. In addition to the dietary benefits, those IVs in home garden production and development also offers employment opportunities, particularly to both urban and rural women, provide more income than staple crops per unit of land. These crops grow quickly, so they provide a fast response to emergent needs for year round food supply. Use of traditional crops is associated with cheap production methods, availability at the doorstep, adaptability to household needs and stimulation of rural and urban economics for the landless in sustainable way. In general, it is strongly believed that indigenous food plants should be considered as a serious issue when developing strategies to fight rural and urban food security in Ethiopia. Therefore, year round production and consumption of these crops are the most sustainable way of reducing and controlling poverty and micronutrient deficiencies in urban and rural poor communities.

Key words: Indigenous vegetables, Alternative food, malnutrition, poverty, Ethiopia

1. INTRODUCTION

The existence of diverse farming systems, socio-economics, cultures and agro-ecologies has endowed Ethiopia with a diverse biological wealth of plants, animals, and microbial species, especially crop diversity (IBC, 2008). According to IBCR (2001), at least 7000 vascular plant species occur in Ethiopia, of which 12% are believed to be endemic. It is also stated in ENBSA (2005) that crops such as Tef (*Eragrostis tef)*, noug (*Guizotia abyssinica*), Ethiopian mustard (*Brassica carinata*), Enset (*Ensete ventricosum*), Oromo dinch (*Plectranthus edulis*), Anchote (*Coccinia abyssinica*) and Coffee (*Coffea arabica*) have great diversity and believed to have originated in Ethiopia.

Due to this vast genetic diversity there are many wild plants which are used for food, especially during periods of food shortages. The majority of such plants are those used as leafy vegetables, edible fruits, tubers and roots. *Corchorus olitorius* for example has nine species which are found in Ethiopia and collected at a young stage and eaten as a cooked vegetable , especially in lowland parts of the country like Afar region and sold in the supermarket and dry leaf send to Djibouti for sell, although, none of them are cultivated. Some of the domesticated plants still also occur with their wild relatives in some parts of the country. Examples are *Thymus* spp. in the Afro-alpine regions of the country; *Enset ventricosum* which occurs both in wild and cultivated state in the medium to higher altitudes; *Gossypium* spp. in the lowlands, as wild and cultivated; and *Sesamum* spp. which is found both cultivated and wild at an elevation below 1800 meters above sea level. There are other wild plants currently attracting attention as potential crops, primarily for their use value. *Cordeauxia edulis* which is used in the arid areas as both feed and food source; *Amaranthus* spp. found as common weed in some parts of the country of which young plants are cooked as vegetable and seeds used for porridge and local beer, are among few of them (IBC, 2008).

Ethiopia has vast genetic diversity of plant species including important indigenous vegetables (IVs) even though they are not consumed properly due to the reason that they are not exhaustively investigated so far. There has been no visible effort made to introduce/domesticate new food materials in our country. Potentially use of IVs by the community has been indicated among which *Corchorus olitorius* in Afar region, *Moringa olifera* in south nation nationality people region (SNNPR) and *Coccinia abyssinica* in Wollega areas are a good examples. It has not planned to study the potential and possible opportunities of IVs as food source. Those IVs are usually referred to as "wild foods" or "famine foods" (Getachew, 2001). In Ethiopia, there was no time when rural population has not been affected by drought, then food shortage which need alternative solution to overcome it.

Many at risk populations in developing countries are deficient in iodine, iron, and vitamin A, making them more vulnerable to illness, fatigue, blindness, and memory loss and increasing the possibility of mental retardation among their children. This is true also in the case of Ethiopia mainly due to cereal based food habit is practicing and largely affect children's in most part of the country. Supplementation, food fortification, dietary diversification, nutrition education and food production are strategies that have been developed to reduce these micronutrient deficiencies and have, for the most part, demonstrated positive, though uneven, results (Workneh *et al*., 1999). On the other hand, it has been reported that IVs are the cheapest source of vitamin A, C, minerals and fiber still people fail to consume enough to meet their nutrient requirement due to lack of knowledge in the nutritional value and production of those vegetables in the easiest way.

Hence, preliminary survey on potential IVs nutritional value and consumption habits has been undertaken in 6 districts of Afar regions. In addition to this, secondary data have been gathered from different sources with the objective to view the potentiality of IVs as an alternative food source in Ethiopia and to put a range of actions to be done for commercialization and policy framework to promote their use and maximize economic value of those vegetables.

2. MATERIALS AND METHODS

Informal guideline interviews and semi-structured questionnaires were conducted with selected key informants about the potential IVs, growing areas and use in addition to secondary data reviewing. In the field opportunistic free and open interviews and discussions were held with farmers, herders, children and women during the extended field visits with photographic documentation of those vegetables.

For practical reasons, the study villages were selected based on representative sub-sections in the areas where potential IVs are available and used as a food source. Based on wealth ranking, informants were selected randomly, for interview and group discussion to identify whether the consumption pattern of IVs varies according to the income level of the community. Documentation of indigenous knowledge on potential IVs food using habit by the rural people and trends in consumption pattern and familiarity with potential IVs in the past 15 years was done. Minimum of 66 and maximum of 150 randomly selected households from the district were involved in the questionnaire and group discussion. In order to describe and compare different categories of the sample units with respect to the desired characteristics, mean and percentage were computed in addition to intensive secondary data gathered from different sources regarding the IVs to supplement significance of results obtained from the survey work.

3. RESULTS AND DISCUSSION

3.1 Why people are shifting to alternative food source in Ethiopia?

3.1.1 Indigenous vegetables provide food security and sustainable food production

The status of vegetable production including indigenous one and consumption in the country yet need further improvement (Fekadu and Dandena, 2006). On the other hand, Ethiopia is well known for its diversity of indigenous food plants, including vegetables. The cultivated vegetables are mainly grown by traditional farmers in home gardens, although some are grown in fields and along field margins. About 27% of the crop species cultivated in home gardens in Ethiopia, many of them indigenous, are used as vegetables (Zemede, 1997). Traditional vegetables do not figure very prominently in modern crop research and conservation programmes rather marginalized in modern agriculture and receive no special attention. The vegetable resources of Ethiopia can be developed through a strategy of complementing and augmenting traditional practices with modern scientific approaches.

About 80% of the respondent indicated that (Table 1) consumption of IVs is mainly during grain shortage which is much greater than the consumption of IVs during any time (12.96%). Similar to the current study, nutritional survey undertaken by GOAL Ethiopia in August 2002 in Afar region of zone 3 indicated that use of wild food has increased from 10% in normal year to 35% in famine period due to serious grain shortage (http://www.rnis39). This is indicating that for the poorest, collection and consumption of IVs may make up an important portion of their daily

dietary intake in most part of the country especially during food shortage. On the other hand those groups of people better income and sufficient grain for food at any time do not consume IVs and consider as "famine" or low class food. They have not been consider that IVs have better nutritional value than other cereals and pulsed due to lack of awareness.

Table 1. Seasonal consumption pattern of indigenous vegetables in selected districts of Afar region, Ethiopia, 2008

Zones	Districts	No of respondents	Seasonal consumption pattern		
			During grain shortage	Any time	Not at all
1	Gewane	140	97	30	13
1	Aysaita	135	106	20	9
	Afambo	150	112	20	18
3	Amibera	67	65	2	0
	Awashfentale	68	65	3	0
	Buremudaitu	66	60	6	0
Total		**626**	**505**	**81**	**40**
Percent		**100**	**80.67**	**12.96**	**6.39**

Source: Own compiled data

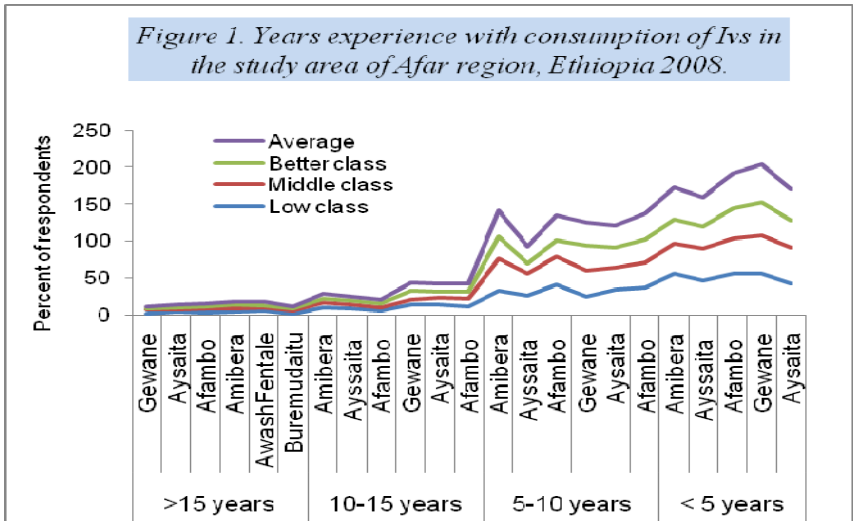
Variation in IVs consumption within different wealth class of the community will justify the fact that only groups of people facing food shortage at certain period of time forced to use those vegetables. Analyzing major consumers of IVs in the study area indicated that variation in consumption pattern during grain shortage positively correlated with the wealth class of the community (Table 2). The data shows that, from the total respondents around 50% is low class community consuming IVs followed by middle class community while the least (11%) consumer are better income group. Hence, the consumption pattern related with food shortage rather than recognizing the nutritional value of those vegetables.

Another interesting result observed from this survey work is that all wealth groups of the community have been getting awareness and recognize the nutritional value of those vegetables through time. According to the respondent information the consumption pattern of IVs has been increasing in the past five years regardless of the income level of the community even though maximum increment was observed for low income group (Figure 1). The major reason for increased IVs consumption in recent time compared to the past 10 to 15 years mainly due to awareness of the people on the nutritional value and recognized that IVs are the potential food easily available at any time compared with other cereals and pulses. This is one opportunity for the increased production and expansion of IVs in Ethiopia to areas where they are less popular or not known at all. The available external market in neighboring countries especially Djibouti provides an additional motive for developing IVs in the country.

Table 2. Major wealth class of indigenous vegetables consumers (%) in selected districts of Afar region, Ethiopia, 2008

Zones	Districts	No of respondents	Major consumers (%)		
			Low class	Middle class	Better class
1	Gewane	140	50.7	39.3	10
	Aysaita	135	60	34	6
	Afambo	150	48	40	12
3	Amibera	67	52	37	11
	Awashfentale	68	51	47	2
	Buremudaitu	66	38	35	27
Total percent		**100**	**49.95**	**38.72**	**11.33**

Source: Own compiled data



It has been reminded that habitat destruction and migration to urban areas make those wild foods are no longer available to the poorest groups. The commercialization of agriculture has displaced many indigenous crops that ensured a balanced rural diet. Therefore, changing in the attitude of the community considering IVs as famine food to an important food at any time than other crops and their small scale household gardening as a food production strategy is one opportunity of shifting to alternative food source and diversification crop production and consumption for better health and economic development of the country.

3.1.2 Fostering economic security and employment for women's

According to the information generated from different respondents and secondary data available IVs are known as insurance crop which may constitute the only source of certain nutrients especially related to health issue and major source of food between grain harvests or when harvests fail. Limited access to resources means that land poor women are more likely to be under employed. Since women are frequently the principal providers for family diets, enhancing their purchasing power and food production capacity has a direct impact on household nutrition and health. In line with this, it was indicated that in most rural areas of Ethiopia home garden based cultivation of IVs have been practicing which is undertaken mainly by women's and children's. Most of those IVs know a day are demanded highly and compute effectively in the local markets, supermarkets and hotels especially at Addis Ababa with exotic vegetables because of its nutritional and cultural food value. For instance, *Coccinia abyssinica* from Wollega/oromia region, *Corchorus olitorius* from Afar region and *Moringa olifera* from SNNP region are a good examples of those IVs demanded highly in the supermarket and cultural food preparation. On the other hand the survey result indicated that Afar women's collect the leaf of some vegetables like *Corchorus olitorius*, dried, packed and selling to foreigners coming to Afar region or send to Djibouti which is indicating the income generation potential of those vegetables.

3.1.3 Protect the environment

Ethiopia has diversified farming systems and agro-ecological conditions which are suitable for the production of various types of crop spp. Majority of IVs in Ethiopia such as *Moringa olifera*,

Enset ventricosum, sweet potato, Cassava, Cactus and like are planted as soil conservation purpose in addition to its use as food value. Due to this fact the people have been using those vegetables in household gardens or around the home state as a fence and shading purpose based on the plant habits which are ecologically sound land management systems. Multiple cropping systems prevent depletion of soil nutrients; the combination of trees, shorter plants, creepers and tubers enhances soil conservation. An advantage of poly cropped, intensively managed gardens planted with locally adapted species is their primary reliance on cultivation practices rather than toxic chemicals to control weeds, pests and diseases. Similar to the current information, Karin (2002) reported also that due to intense soil tillage IVs like *Enset ventricosum* has a positive impact on soil fertility and micro climate, and shows soil preserving capabilities.

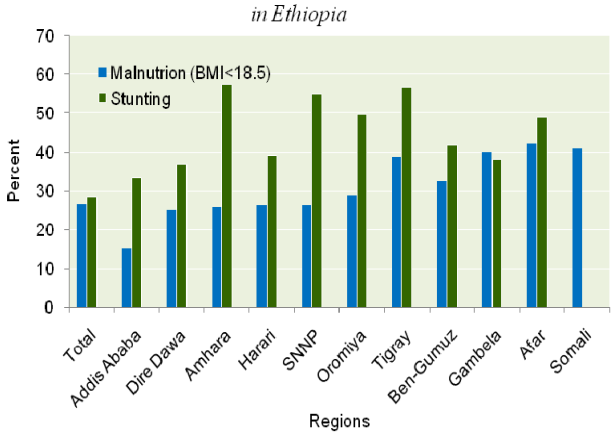
3.1.4 Production and use mainly depend on locally available resources

The occurrence of those IVs in environmentally friendly and low input crop in their production make them organic and safe product for consumption. Among low income households the factors of production, including time, energy, money and land are available in small discrete increments through time and space. In most parts of the country IVs production and consumption related with the low production cost, less management and adaptability of the crops to the traditional farming system. Farmers indicated that without or with minimum management, and input application those plant species grow very well than exotic vegetables and provide safe and health food at different seasons especially when other grain production fails for their families. They also effectively utilize small amounts of the spare time of family members, especially women, children and the elderly and can simply produce, collect and use as a food source.

3.1.5 Supply vitamins and micronutrient to the consumer

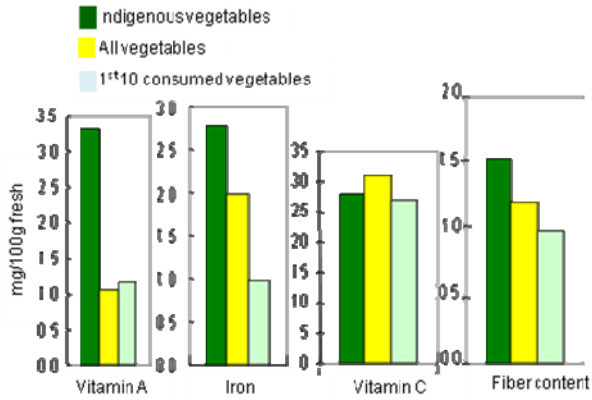
Even though the farmers did not know the scientific justification regarding for eating IVs, they related with health problems they face and relief they will get after consuming those vegetables. Among the micronutrient problem Ethiopia is facing now a day is vitamin A deficiency which can be related with poor nutrition problems (Girma and Timotiows, 2002). Many research reports indicated that an estimated five million people are suffering from lack of vitamins and essential minerals (Figure 2). Lasting long solution to vitamin A deficiency problems in Ethiopia especially for children's rest on increasing the availability of vitamin A rich foods to the most vulnerable groups which is a good opportunity to tack the problem and increase the production and consumption of potential IVs. In line with this, IVs have the potential nutritional value and cheap source of vitamins like A, C and minerals such as iron, calcium and phosphorous (Figure 3). It was also reported that household cultivation of vegetables and fruits (86% of the vitamin A intake in Asia and Africa comes from plant sources) has proved to be the most effective solution. In short, support for small scale family food production can confer enormous health and economic benefits to the most deprived sectors of the developing world population at a relatively low cost while safeguarding the environment. This is the justification that the minerals and vitamins content and nutritional value of IVs are by far better than exotic vegetables.

Figure 2. Malnutrition in mothers of children under 5 years and stunting in childrens under 3 years by regions in Ethiopia



Source: Girma and Timotiows, 2002

Figure 3. Nutritional value compression of Indigenous and exotic vegetables



Source: World Vegetable Center-RCA, 2006, 13th regional training manual (unpublished)

3.1.6. Used for medicinal value and ceremonial purpose

Most of those vegetables have been reported to have medicinal properties (Schippers, 2000). According to the information obtained some people are experienced in using those crops like jute mallow in Afar region for special occasions like for pregnant and nursing mothers. A decoction of boiled leaves of this vegetable is taken to facilitate childbirth, treat stomachache and relieve constipation. It is also given to boys after circumcision. In Wollega areas of oromia region anchote is widely used for the control of gonorrhea, Tuberculoses and cancer. In addition to this people reported that it is the potential plant for treatment of bone fracture, displaced joint and used for ceremonial purpose like wedding, child birth day, and service for special gusts and use for animal fattening. Other vegetables report as medicinal value by the community includes *Basela alba* for stomachache and constipation; *Moringa oleifera* for impotence; *Cleome gynandra* for constipation and facilitates birth; *Rumex nepalensis* for poisons-immediately causes vomiting and diarrhea are the major one.

3.2 Major constraints to IVs crops production and use in Ethiopia

3.2.1 Research related drawback

The significant role of IVs in the Ethiopian food source, nutritional and medicinal value in addition to its genetic pool for the conservation and utilization have been over looked by the Ethiopian research systems. Research in Ethiopia has largely concentrated on the more important cereal, oil and industrial crops. Most of the IV crops are produced by small farmers following traditional practices and localized in specific place and community in the country. There is no direct attention paid to non cultivated species. They are not fully documented and no programmes are currently aimed at their development and production except conservation activities at some research centers. The need for research in various aspects of IVs production has been stressed. Modern production of vegetables in Ethiopia has thus far concentrated on non-indigenous species. Research and modernization of production of IVs must be taken more seriously. The IVs of Ethiopia are in need of enhanced research programmes if they are to contribute to national food security and farmers' wellbeing.

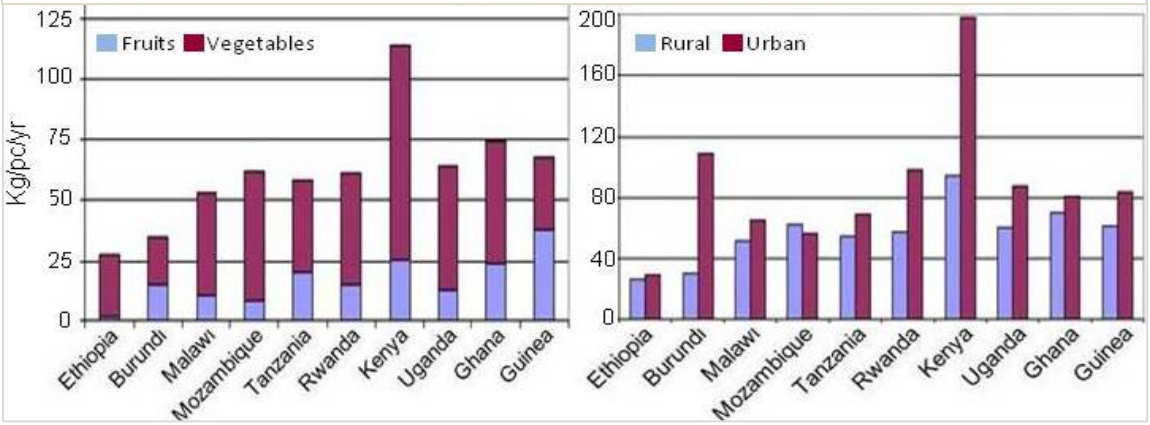
3.2.2 Lack of technical advice and information on nutritional value

The lack of extensions service including NGO's has been single out as the major constraint to sustain IVs development in Ethiopia. Due to the information gap and cultural problems those plant species are considered as weed, low family or children food, and plants of less value from the nutritional point of view. Both research institutions, NGOs and other sectors engaged in agricultural development sector give service and advice mainly on exotic vegetables but not on production systems for IVs because they have no program and projects they are running with IVs. Generally, improved agronomic packages provided to farmers are for staple and cash crops and often have little or nothing to do with IVs. There is also lack of published information about IVs. Research attempts have been made to address some of the production constraints and provision of sufficient awareness for the people on the nutritive and economic advantage of these crops.

3.2.3 Local traditions

A cereal and animal based food habit of Ethiopia is the dominant one and due to this fact fruit and vegetable crops consumption in general and IV crops in particular are very low compared to other African countries (Figure 4). Traditionally the rural populations have not been accustomed to utilize most of fruit and vegetable crops as food substitute compared with other sub African countries. For instance, the survey report indicated in sub Saharan African shows that fruit and vegetables per capital and rural and urban consumption clearly show that Ethiopia is the least among other African courtiers. According to the information available, indigenous crops consumption considered as shame and insult. In normal times only children, youngsters and the poorest families regularly collect and consume IVs. Many survey report addresses, farmers interviewed stated that all the IV plant species collected are not consumed by the majority of the population except when there is a serious shortage of food affecting all strata of the population from the poorest to the richest.

Figure 4. Fruits and vegetables per capital consumption per year (kg/pc/yr) (left) and consumption in the rural and urban areas (right) in sub-Saharan Africa



Source: World Health Organization (WHO, 2005)

However, the current trends indicating that peoples have been experiences the consumption habit of IVs as an alternative food source due to change in farming systems, awareness created on the nutritional value of those vegetables through the long period experience developed in the

community and its cheap availability compared to other cereal crops. According to the information available not all people encountered were willing to provide information about IV and particularly famine food. Some of the farmers when questioned obviously felt ashamed and maybe offended by outsiders asking questions about such sensitive issues as the consumption of famine food. Some of the IVs have such low value that their names are sometimes used as insults in certain areas (Guinand and Dechassa, 2001).

3.2.4 Cultural and religious constraints

Ethiopians generally are constrained to the consumption of the commonly cultivated crops and neglect wild plants like *Amaranthus spp.,* Ethiopian mustard (*Brassica carinata*) and *Solanium spp.* that has clearly demonstrated their production potential in pocket areas of the country. Strong traditions, beliefs and religious taboos still obstruct people's psychological and mental willingness to domesticate and cultivate IVs. This is a reality that cannot be denied and has to be confronted if the full potential of the indigenous Ethiopian flora as a source of food is to be effectively exploited (Guinand and Dechassa, 2001). Furthermore, the author indicated that, religion, particularly of the Christian Orthodox Church of Ethiopia, represents a major constraint to the use and consumption of wild plants and animals. For the believers, the consumption of wild plants and animals does not conform to their system of traditional and religious beliefs.

4. SUMMARY AND CONCLUSIONS

Ethiopia has highly-diversified agro-ecological conditions which are suitable for the production of various types of fruit and vegetables. On the other hand, many IV crops originated from Ethiopia such as Ethiopian mustard (*Brassica carinata*), Amaranths (*Amaranths spp*), Kale (*Brassica nigira*), Jute Mallow (*Corchorus olitorius* L), Enset (*Ensete ventricosum*), *Plectranthus edulis*, *Coccinia abyssinica*, *Moringa olifera* and likes are inexpensive and accessible source of essential nutrients to a country like Ethiopia where the people experience malnutrition problems.

The potential IV production and research have been a catalyst for rural development, source of balanced nutrients and means for increasing income of the farmers. It was also strongly believed that IVs should be considered as a serious issue when developing strategies for integrated development programmes for chronic food insecure areas in Ethiopia. Indigenous vegetables have rescued thousands of hungry Ethiopians during famine period and it is a bridge during periods of grain shortage, crucial to food security. Little is known about their agronomy, genetic diversity, nutritive value, germplasm management and improvement of their yield. There is an urgent need to identify the most effective commercialization, marketing and policy frameworks to promote their use and maximize their economic value. Currently, those IVs are becoming popular and widely used as leafy vegetable throughout the year by most group of the society and have the potential for becoming useful staple food. Those IVs have a valuable source of vitamins, carbohydrate and minerals in addition to cultural and medicinal value. Due to this fact in Afar region people are using jute mallow for special occasions like for pregnant and nursing mothers, a decoction of the boiled leaves is taken to facilitate childbirth, treat stomachache and constipation, given to boys after circumcision. Similarly people in Wollega areas/oromia region use anchote for treatment of bone fracture, displaced joint, cancer, gonorrhea, and ceremonial purpose like wedding, and child bird celebration. Therefore, to combat these problems which contribute to the growth of vegetable industry particularly potential IVs there by augmenting the national economy and improving people's health and standard of living the following recommendations were forwarded:

1. Collect, identify, and select as many varieties as possible of IV crops from the target localities to ensure diversity; conduct consumer acceptability tests on promising varieties.
2. Development of appropriate agronomic practices, increase production and nutritional value
3. Include IVs in the curricula of higher learning institutions and develop a strategy that invite MSc and phD research topic.
4. Development of regional networking with partner institutions and exchange of information and genetic resources.
5. Bothe regional and federal research centers, universities and other institutions should focus as priority area for research and development in collection, conservation, technology generation and promotion of potential IVs at different agro ecologies.

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